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# SOUTHWEST FISHERIES CENTER

## MONTHLY REPORT - SEPTEMBER 1981

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# SOUTHWEST FISHERIES CENTER

## LA JOLLA, CALIFORNIA

HONOLULU LABORATORY
LA JOLLA LABORATORY
TIBURON LABORATORY
PACIFIC ENVIRONMENTAL GROUP

## MONTHLY REPORT - SEPTEMBER 1981

STATUS OF PUBLICATIONS

Published

Benville, Pete E., Thomas G. Yocom, Pepsi Nunes, and Jeffrey M. O'Neill. 1981. Simple, continuous-flow systems for dissolving the water-soluble components of crude oil into sea-water for acute or chronic exposure of marine organisms. Water Research 15: 1197-1204.

A continuous flow apparatus, referred to as a solubilizer, was constructed to dissolve the water-soluble fraction (WSF) of crude oil into water for short and long-term experiments with marine organisms. This system dissolves the water-soluble components of crude oil without the loss of the more volatile compounds and without the formation of emulsions or oil droplets. A single solubilizer system (open flow) with a 3 ml min-1 oil flow and a 11 min-1 sea-water flow generated approx. 1.4 ppm of the total monoaromatics, which includes benzene, toluene, ethylbenzene and the three xylene isomars [sic]. This concentration varied depending on physical parameters and the chemical composition of the crude oil and water. With only slight modifications of the basic continuous flow system, a higher concentration (>3.4 ppm total monoaromatics) of the water-soluble fraction of crude oil was achieved. By recirculating the water supply, concentrations of 6.7-11 ppm total monoaromatics in the WSF were produced. The stability, reproducibility, and reliability of the four systems were demonstrated in several experiments. Researchers working in aquatic systems with crude oil can well appreciate a simple system that is easily cleaned, relatively maintenance-free, and which produces stable, reproducible concentrations of the WSF over extended periods of time. The increasing demands for ecological studies in aquatic organisms with crude oil, a difficult mixture of chemicals with which to work, precipitated the development of these solubilizer systems.

*THIS REPORT DOES NOT CONSTITUTE PUBLICATION AND IS FOR INFORMATION ONLY.*

O'Connell, Charles P. 1981. Development of organ systems in the northern anchovy, Engraulis mordax, and other teleosts. Amer. Zool. 21: 429-446.

Certain aspects of development that are indicative of changing functional and ecological capabilities are reviewed for six different organ systems (integument, lateral line, eye, digestive tract, gas bladder, and trunk musculature) in the northern anchovy, Engraulis mordax, and other teleosts. Much of the development in the anchovy after hatching or after feeding begins can be characterized as initial differentiation and then continued recruitment of specialized cells. Behavior patterns appear to develop in conjunction with such recruitments. This may apply to fishes in general, but pattern and tempo of development must differ among species. Brief comparison of the anchovy and Pacific mackerel, which has a more rapid and direct development, suggests that some of the differences in the two types of larvae relate to the marked differences in feeding modes of the adult stages.

## Administrative Reports

### La Jolla Laboratory

Hanan, Doyle P. 1981. An overview of Pacific bluefin tuna and data base description. SWFC Admin. Rep. LJ-81-18C.

## Translations

Espina, Patricio Arana, and Monica Tiffou M. 1970. Sexual maturity, sexuality and fecundity of the nylon shrimp, Heterocarpus reedi. Invest. Mar. Univ. Catol. Valparaiso 1(11):260-281. (Engl. transl. by Wilvan G. Van Campen for the Southwest Fisheries Center Honolulu Laboratory, 1981, 16 p., Transl. No. 55; available Southwest Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96812.) [Limited distribution]

Kotlyar, A.N. 1980. Paratrachichthys (Aulotrachichthys) Novaezelandicus sp. n. (Pisces, Beryciformes, Trachichthyidae) from the waters of New Zealand. Zool. Zh. 59(2):309-312. (Engl. transl. by James C. Cooper, 1981, 6 p., Transl. No. 57; available Southwest Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96812.) [Limited distribution]

Approved by Center Director

Huppert, Daniel D. Economic research needs for living marine resources. For consideration for publication in Workshop Papers on Ocean Resources Economics.

Lo, Nancy C.H. Sample size for a stratified ratio estimator of dolphin mortality. For consideration for publication in the Journal of Wildlife Management.

Perrin, William F. and Charles W. Oliver. Time/area distribution and composition of the incidental kill of dolphins and small whales in the U.S. purse-seine fishery for tuna in the eastern tropical Pacific, 1979-1980. For consideration for publication as an International Whaling Commission Symposium paper.

Samples, Karl C., and James H. Prescott. The use of sail-assisted commercial fishing vessels in the Pacific: An economic appraisal. (Abstr.) For consideration for publication in papers from the International Conference on Ocean Resource Development in the Pacific, Honolulu, Hawaii, October 13-15, 1981.

Walker, M.M. and A.E. Dizon. Identification of magnetite in tuna. (Abstr.) For consideration for publication in papers from the American Geophysical Union Fall Meeting, San Francisco, California, December 7-11, 1981.

# HONOLULU LABORATORY

## INSULAR RESOURCES INVESTIGATIONS

### Honolulu Laboratory Invertebrate Collection Being Transferred to Bishop Museum

Following negotiations initiated in early 1980 between the Bernice P. Bishop Museum, Honolulu, Hawaii, and the SWFC's Honolulu Laboratory, and also involving the U.S. National Museum, the Bishop Museum was awarded funds in early 1981 from the National Science Foundation to begin work on the transfer of the Honolulu Laboratory's large marine invertebrate collection to the Bishop Museum. The invertebrate collection was made during a period from the 1960's to the present on the NOAA research vessel Townsend Cromwell. The collection includes material from all invertebrate phyla primarily collected at depths of 200 to 500 m on soft bottoms. The work is under the general supervision of Dr. Dennis Devaney, head of the Division of Invertebrate Zoology, and the sorting of the specimens at the Honolulu Laboratory is being directed by Beatrice L. Burch; both are Bishop Museum staff members.

The collections are expected to provide much new important information on marine invertebrates around the Hawaiian Islands. For example, several groups of animals, which are endemic to the Hawaiian Islands, will represent great additions to any museum collection as they are known only by a few specimens in the U.S. National Museum or in the Bishop Museum. Among the Bivalvia, Ostrea laysana Dall, Bartsch and Rehdor, and Euciroa pacifica Dall were found abundantly at one or two stations, whereas previously they had been known only from a few specimens.

### Processing of Northwestern Hawaiian Islands Biological Samples Continues

This month researchers in the Insular Ecosystem Study continued to process biological samples collected around the Northwestern Hawaiian Islands (NWHI) and at the local fish auction market. Research Assistants Bert S. Kikkawa and Alan R. Everson weighed more than 4,500 ovaries collected from kahala, Seriola dumerili, over a 2-year period at the Honolulu auction market. They have determined the reproductive developmental stage of about 200 of the ovaries which will be compared with gonadosomatic indices they have computed for the kahala. Kikkawa and Everson also sorted through 600 stomach samples of kahala which may possibly be ciguatoxic. The purpose of this study is to determine if there is any relationship between the diet and toxicity of ciguatoxic fish.

Research Assistant Victor A. Honda has completed the laboratory processing of berried spiny lobster, Panulirus marginatus, for his fecundity study. Estimates of the fecundity of 76 female lobsters ranging from 53.1 to

143.8 mm in carapace length have been completed. Honda is analyzing the linearity in the relationship between fecundity and carapace length and the homogeneity of diameters between eggs on the left and right pleopods and among eggs of the first four pleopods. These results will be included in a manuscript being prepared by Honda.

James H. Uchiyama, Fishery Biologist, extracted over a hundred pairs of otoliths from snappers, groupers, and carangids collected on cruises to the NWHI in 1981. The otoliths are being prepared for the counting of daily growth rings.

## Movie Footage, Data Base Reviewed for Spiny Lobster Fishery Management Plan

Fishery Biologist Reginald M. Gooding has reviewed approximately 1,150 m (3,800 ft) of 16-mm movie footage taken of sharks and large carangids preying upon spiny lobster, Panulirus marginatus. The lobsters were released at the surface and on the bottom during Townsend Cromwell cruise 81-04, the last in a series of survey and assessment cruises to the Northwestern Hawaiian Islands (NWHI). The results of the analysis of the film will be used for an Administrative Report describing the current status of knowledge on the predation of large predators on berried and sublegal spiny lobsters released at the surface or on the bottom during research and commercial fishing operations in the NWHI.

In the continuing effort to improve the data base for the draft spiny lobster fishery management plan, Dr. Jeffrey J. Polovina, Statistician, assisted by Research Assistant Darryl T. Tagami, analyzed the relationship between relative population egg production and tail width of spiny lobsters based on data from 381 female lobsters collected on Townsend Cromwell cruise 81-04.

## Seabird Food Items Identified for Energetics Study

In cooperation with Dr. G. Causey Whittow, Department of Physiology, University of Hawaii, Research Assistant Michael P. Seki has identified seabird forage organisms collected from seabird spew samples by Craig S. Harrison of the U.S. Fish and Wildlife Service and during night-light stations aboard the NOAA ship Townsend Cromwell in the Northwestern Hawaiian Islands. The organisms identified included fishes from the families Monacanthidae, Exocoetidae, Myctophidae, Ostraciontidae, Gempylidae, Bramidae, Scombridae, Coryphaenidae, Acanthuridae and Holocentridae, and a squid belonging to the Family Ommastrephidae. Whittow will analyze the forage organisms for their caloric content as part of a seabird energetics study.

* * * * * * * * * *

Richard N. Uchida, Leader of the Insular Ecosystem Study, has completed a draft of a document, "Part II. Summary of environment and fishing information of Guam and the Northern Mariana Islands."

## FISHERY MANAGEMENT PROGRAM

### FY 1982 Socio-Economic Research Discussed

Plans for socio-economic research at the Honolulu Laboratory in FY 1982 were discussed at a meeting attended by Laboratory Director Richard S. Shomura, Research Assistant James C. Cooper, Computer Systems Analyst David C. Hamm, Statistician Gary L. Kamer, Fishery Biologists Dr. Robert A. Skillman and James H. Uchiyama, and Dr. Jerry A. Wetherall, Leader of the Pelagic Stock Assessment Study. Because this research at the Laboratory is directly related to the preparation of fishery management plans, those plans completed or in preparation by the Western Pacific Regional Fishery Management Council (WPRFMC) were also discussed. Topics of the WPRFMC fishery management plans include precious coral, seamount resources, spiny lobster (draft plan), billfish (draft plan), and bottomfish (plan under development).

Discussion also centered upon other fisheries of interest to the Honolulu Laboratory and WPRFMC: Hawaiian baitboat, longline, ika-shibi, troll-charter, troll-recreational, commercial albacore, trap, and others (opelu, Decapterus spp., akule, Trachurops crumenopthalmus). Ongoing socio-economic activities as well as data collecting activities being planned were also discussed: the Hawaii wholesale fish dealer survey (ongoing); cost/earnings study of the Hawaiian longline fishery, deep-sea handline bottom fish fishery, ika-shibi fishery (contract now being negotiated), and the vessel inventory contract (just recently completed and funded by WPRFMC).

It was concluded at the meeting that the following socio-economic projects, listed in order of priority, should be initiated in FY 1982: 1) vessel/verification/classification, 2) statewide analysis of the Hawaii charter boat industry, and 3) market study for mahimahi, Coryphaena hippurus, and wahoo, Acanthocybium solandri, in Hawaii and Guam.

### Hawaii Skipjack Tuna Landings Continue Below Long-term Average

The September 1981 Hawaii landings of skipjack tuna were estimated at 214 metric tons (MT) which is 26 MT above the September 1980 landings and 147 MT below the 1964-79 long-term average for September. The cumulative landings from January through September were estimated at 1,952 MT, which is 526 MT above the 1980 landings for the same period and 1,493 MT below the 1964-79 long-term average for the same period.

## PELAGIC RESOURCES INVESTIGATION

### Magnetite Found in Green Turtles

Anjanette S. Perry, University of Hawaii graduate student, reported that magnetic material found in the membranes surrounding the brain (the dura) of green turtles has been confirmed as magnetite ($FeO.Fe_2O_3$). Magnetic remanence in the dura had previously been discovered utilizing the superconducting (SQUID) magnetometer at the Institute of Geophysics, University of Hawaii. Dura and brain tissue collected from captive juvenile green turtles that had died naturally were digested with 5.25% sodium hypochlorite and the mixture repeatedly centrifuged. Opaque particles remaining in the centrifuged residue were removed and placed on glass slides for X-ray diffraction. The diffraction pattern was clear and unambiguously that expected for magnetite. Magnetite therefore may be the basis for a magnetic-sensing mechanism in migratory marine turtles as well as being involved in the magnetic sensory mechanisms in tuna, homing pigeons, and other species.

### Relationship Between the Earth's Magnetic Field and Skipjack Tuna Catches Analyzed

Dr. Andrew E. Dizon, Leader of the Pelagic Ecosystem Study, Dr. Robert A. Skillman, Fishery Biologist, and Gary L. Kamer, Statistician, have been investigating the relationship between the Hawaiian catch of skipjack tuna and the perturbations in the earth's magnetic field. Initial analyses indicated that the relationship between magnetic field perturbations and skipjack tuna catch is different at high and low levels of magnetic noise. Additional data are being analyzed to corroborate this finding and to explain the rationale for such a relationship.

# LA JOLLA LABORATORY

## Coastal Fisheries Resources Division

### LARVAL FISHES, COASTAL EAST PACIFIC PROGRAM

#### Measurement of Batch Fecundity in Northern Anchovy Shows Increase in 1981

Dr. John Hunter, Program Leader, reports that measurement of batch fecundity of northern anchovy from the 1981 surveys by program staff indicates a 35-50% increase in batch fecundity compared to the previous 3 years. Batch fecundity is defined as the number of eggs produced by a female in one spawning; current evidence indicates that female anchovy may average 20 spawnings per year. For this study, fecundity was measured by counting the number of hydrated eggs found in the ovaries of 130 northern anchovy females ranging in length from 8.1 to 14.7 cm (4.9-32.5 g).

Fecundity estimates for the February-March 1981 survey were approximately equal to those for March-April 1981; the data were therefore combined to estimate batch fecundity for 1981. The form of the relationship between female weight and number of eggs was roughly linear and can be expressed by the function, $Y = -2031 + 753X$, where Y is the number of hydrated eggs in the ovary (estimated from the average of three subsamples of ovarian tissue) and X is the female's weight in formalin minus the ovary (S.D. of intercept = 621, S.D. of slope = 39.36, and $r^2 = 0.74$).

The increase in batch fecundity for 1981 appears to be due to a general increase in fecundity in fish of all sizes (average fecundity was higher in each 5-gram weight class) rather than a change in the form of relationship between fecundity and weight. Relative fecundity for females of 15-20 g was 602 eggs/g female-weight in 1981, compared to 334, 477, and 442 eggs/g female-weight in 1978, 1979, and 1980, respectively. Similarly, relative fecundity for all females was 597 $\pm$ 33 eggs/g female-weight in 1981 (mean $\pm$ 2 X SE of mean) while it ranged from 389 $\pm$ 59, to 444 $\pm$ 28 eggs/g female-weight in 1978-1980. According to data collected by Fishery Biologist John MacGregor, the batch fecundity for females in 1981 is approximately equal to that in 1951-1960. Thus significant annual fluctuations in batch fecundity seem to occur in the central subpopulation of northern anchovy over the years, with even greater differences existing among subpopulations. The mechanisms responsible for such changes are unknown.

#### Diet-Induced Differences in Growth Rates of Larval Northern Anchovy Analyzed

This month Fishery Biologist Gail Theilacker began to analyze data collected from a series of experiments examining feeding and growth in larval

northern anchovy. Theilacker's objective is to determine how variations in prey type and density affect larval fish feeding rates, daily ration, evacuation, otolith size and increment number, growth (increase in size and dry weight), and gross growth efficiencies.

During the study four groups of anchovy larvae were fed a different diet: high and low densities of rotifers and high and low densities of copepod nauplii. Preliminary results on the diet-induced differences in the larval growth rates indicate that average daily growth rates for 4-6 mm larvae (5-9 days of age) fed on rotifers at 25/ml and those fed on copepod nauplii at 2/ml were both 0.40 mm/day. During the same period, larvae raised at 2 rotifers/ml grew at 0.25mm/day while those given 0.1 copepod nauplii/ml grew at 0.2mm/day. For comparison, growth rates of field-collected 8 mm anchovy larvae have been estimated to be 0.37 mm/day and laboratory-reared 8 mm anchovy larvae fed rotifers at 25/ml were found to grow at 0.40 mm/day. Thus anchovy growth rates in the field at unknown prey densities appear to be the same as laboratory growth rates of larvae fed either 25 rotifers/ml or 2 copepod nauplii/ml.

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Fishery Biologist Gail Theilacker, assisted by Biological Technician Jack Metoyer, is preparing sea-collected jack mackerel larvae for histological examination. The condition of these larvae will be analyzed as part of a study to evaluate factors affecting the survival of jack mackerel larvae in the sea.

## COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT PROGRAM

### Complete Revision of Anchovy Management Plan Undertaken

This month a complete revision of the anchovy management plan was undertaken by Fishery Biologist Dr. Gary Stauffer and Industry Economist Dr. Daniel Huppert of the Southwest Fisheries Center, and Alec MacCall and Herb Frey of the California Department of Fish and Game; these members of the anchovy management plan development team were assisted by Economist Jane McMillan, SWFC. The team had been asked by the Pacific Fishery Management Council at its July meeting in Boise, Idaho, to prepare amendments to the plan which would 1) accommodate the new egg production method for estimating biomass into the yield model and fishery management plan (FMP), and 2) consider modifications of 5-inch minimum size limit and fishing seasons for the reduction fishery.

The revision undertaken in September involved an update of the descriptive and statistical information and a conversion to metric units. Revisions were completed on descriptive sections of the fishery, history of

exploitation, history of research and management, socio-economic characteristics, recreational fishing, and biological aspects of the stock. The team also prepared an extensive report describing the proposed changes; this report will be presented at the Council's October 7 meeting in Los Angeles.

The team believes the following activities would facilitate completion of the plan revision: 1) examination of new flexible procedures for annual specification of domestic annual harvest (DAH), domestic annual processing (DAP), joint venture processing (JVP), and total allowable level of foreign fishing (TALFF) without requiring plan amendments to change the estimates; 2) consideration of alternative ways to incorporate the Mexican harvest in the conserrvation regime, given that it is unlikely that a cooperative bilateral management scheme will develop in the coming years; 3) review and modification of the reporting requirements of the fishermen and processors; and 4) review and consideration of pelican/anchovy interactions in the evaluations of various management measures in view of the U.S. Fish and Wildlife Service's draft Pelican Recovery Plan (in preparation).

## 1981 Anchovy Survey Data Being Processed

Dr. Gary Stauffer, Fishery Biologist, reports that the compilation of the 1981 CalVET anchovy egg data base has been completed for both the 8102 and 8104 surveys. Stauffer and Statistician Susan Picquelle have aged all eggs collected according to time of sample, surface water temperature, and laboratory rates of development. Rich Charter, CalCOFI Data Manager, and James Thrailkill, Fishery Biologist, entered the aged egg data into the files and verified the file accuracy.

Stauffer and Computer Specialist Susan Iacometti are currently editing the data files which have been created for the adult anchovy taken during the 8102 trawl survey. The processing of the frozen collections for sex ratio determinations was completed for both surveys in mid-September. In addition, data files have been created for the 8102 survey and fecundity data files for both the 8102 and 8104 cruises have been created and verified. Dr. Nancy Lo, Statistician, has been analyzing the relationship of fecundity versus fish weights to be used in estimating populations fecundity. The processing of gonad samples is now underway and should be completed in mid-October. The compilation of the data files should be completed by the end of October.

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Fishery Biologist James Thrailkill reports that the plankton sorting group has completed sorting the bongo samples from CalCOFI cruise 8102 and is now working on samples from the 8107 David Starr Jordan cruise.

## MULTISPECIES TAXONOMY PROGRAM

### Data on Vertical Distribution of Anchovy Eggs, Larvae Processed

This month members of the Multispecies Taxonomy Program continued to analyze data from the vertical distribution cruise 8003 of the research vessel, Ellen B. Scripps. Richard Charter, CalCOFI Data Manager, and Carol Miller, Student Aid, worked with Program Leader Dr. Geoff Moser to complete a description of the vertical distribution of anchovy eggs and larvae for each station and a summary of the day/night vertical stratification.

### Descriptions of Croaker Early Life Histories in Preparation

Progress continues in the task of describing the early life histories of California croaker species. Fishery Biologist Dr. Geoff Moser compiled morphometric data for yellowfin croaker larvae and juveniles, and Fishery Biologist Barbara MacCall illustrated the larval series for this species. Biological Laboratory Technician Elaine Sandknop compiled distribution data for croakers taken in CalCOFI tows. MacCall also worked on a manuscript describing the early life history stages of important carangid (jack) species in the CalCOFI region, and Biological Technician Betsy Stevens drafted a paper describing the reproduction and development of the blenny, Hypsoblennius jenkinsi.

## ALBACORE FISHERIES PROGRAM

### CTD System Installed Aboard the DAVID STARR JORDAN

Ronald Lynn, Oceanographer, reports that the micro-computer controlling the CTD (conductivity/temperature/depth profiler) instrumentation aboard the NOAA research vessel, David Starr Jordan, has been upgraded by the installation of a memory expansion and a systems programming ROM (read-only memory). Lynn and Oceanographer Ken Bliss rewrote the CTD programming for more efficient and effective data collection; this new programming was tested on the albacore physiology cruise conducted in August (see the August 1981 Center Monthly Report for cruise details).

The new programs are now complete and ready for general use. Unfortunately, the plotter broke down during the cruise and obviated a test of the real-time plot feature; this test must await a future opportunity. When the plotting function is on-line it will permit a placement of water samplers within defined features of the water column during the CTD cast. The upgraded system allows CTD data to be collected at higher resolution and to be processed at a faster rate. The micro-computer will also now be able to act as a terminal for the transfer of CTD data to and from the mainline computers.

There is a need to transfer a large body of CTD data collected in recent years to the primary data archives. Bliss is developing programs for this function.

## Albacore Sonic Tracking Data Reworked

In order to facilitate position data processing for the albacore sonic tracking cruise (described in the August 1981 issue of the Center Monthly Report), Oceanographer Ron Lynn acquired and reworked two versions of a computer program to convert LORAN C (long-range navigation) readings to latitude and longitude. One version having high accuracy and multiple options for navigational computations is used on the H-P model 41CV hand calculator; the other is faster but slightly less accurate and can be used on either the H-P 97 or H-P 41CV.

Biological Technician Ron Dotson completed the conversion of LORAN C positions to latitude and longitude for four albacore tagged with ultrasonic depth transmitters which were tracked during August in an albacore tracking experiment conducted aboard the chartered F/V Greek Isle. These tracking data are now being entered onto data tapes for processing on the Hewlett-Packard 9825. Oceanographer Ken Bliss has rewritten the processing programs to increase their efficiency and utility with a new data format designed to simplify handling of the data.

Preliminary analysis of the data indicates that the albacore tracked tended to remain in the vicinity of a 1658-fathom seamount. The first albacore (80-cm fork length) was tagged at 18:46 on August 20 and tracked until 0602 on August 21. During the tracking period it spent the majority of the time at 100 meters depth in 15.5°C. Swimming speeds were typically 40 to 300 cm/sec with an average of approximately 80 cm/sec and one short burst of 1200 cm/sec during the track. Further analysis of this fish and the other three is expected to be completed by the end of October.

# SURVEY SYSTEMS DEVELOPMENT AND EVALUATION PROGRAM

## P. Smith Participates in Cooperative SWFC-Peru Anchoveta Survey

On September 25, Dr. Paul Smith, Fishery Biologist, returned from Ecuador and Peru where he had been engaged in cooperative work on quantitative surveys of fish populations. In Ecuador, Smith visited Maria Harmsen, Instituto Nacional de Pesca, Guayaquil, Ecuador, who is conducting 1-meter ring net surveys of fish eggs and larvae off the entire mainland coast of Ecuador and the Galapagos Islands. Smith also introduced the egg production method for estimating spawning biomass which has been developed by the staff of the Coastal Fisheries Resources Division of the Southwest Fisheries Center over the past 3 years. Dr. Jiminez, Institute Director, is sending a biologist to the Center to learn the ovarian histological techniques which are used in the egg production method; this knowledge will be used in studies off the Peruvian coastline. Harmsen will also visit the Center to learn the techniques of the CalVET tow and how to age and stage eggs for this method.

In Peru, Smith participated in a cruise of the Humboldt, a new 70-m Peruvian vessel donated by the West German government. A total of 925 vertical egg tows was taken during the cruise which was led by Dra. Haydee Santander, Leader of the Ichthyoplankton Project at the Instituto del Mar del Peru (IMARPE), Callao, Peru. Dra. Santander participated in a similar cruise off California last April and planned the Peruvian cruise using the Coastal Division's graphic system for cruise planning and documentation. Under a contract to IMARPE, Dr. Jurgen Alheit, Biologist for the ichthyoplankton section of the Peruvian-German Cooperative Program (PROCOPA), conducted the sampling of adult anchoveta from a bolichera (purse seiner). Smith wrote and implemented eight computer programs for the IMARPE minicomputer to assist in the data entry, check, and analysis for the SWFC egg production method estimate of sardine egg production and anchoveta spawning biomass. Ten years ago the Peruvian anchoveta was the most productive fish stock in the world, yielding 1/5 of the world's catch. The fishery has not yet recovered from its collapse in 1972.

### Draft Documents EDMAP2: A General Contouring Program

Oceanographer Larry Eber has completed the first draft of a report documenting his algol computer contouring program EDMAP2 (Environmental Data Mapping Program, Version 2). The program was designed to fit fields of randomly-spaced data to a two-dimensional grid. The resulting gridfields can be saved on disk files and later retrieved for combining with other fields, or for graphic display as digital or contoured plots. EDMAP2 is structured from five components which perform the functions of 1) program flow and file control, 2) data input from source files, 3) analysis of data to gridpoints, 4) computing contour coordinates, and 5) creating the plots. For many years precursors of EDMAP2 have been used at the Southwest Fisheries Center to prepare environmental charts published in Fishing Information and were also used to produce two CalCOFI Atlases.

## Oceanic Fisheries Resources Division

## MARINE MAMMAL BIOLOGY PROGRAM

### Review of Dolphin Reproductive Parameters Underway

Dr. William Perrin, Leader of the Marine Mammal Biology Program, reports that the upcoming conference, "Cetacean Reproduction: Estimating Parameters for Stock Assessment and Management," will include reviews of the status of knowledge of reproductive biology of the major cetacean groups. At the conference, to be held November 27-December 7, 1981 in La Jolla, California, Perrin and Dr. Steven Reilly, National Research Council Senior Research Fellow, will present a review of reproduction in the dolphins and small whales of the family Delphinidae (the porpoises will be treated in a separate review

by D. Gaskin of the University of Guelph). The review has two purposes: to identify and describe patterns and trends within and among species, and to critically examine assumptions and methodology used to arrive at estimates of the various parameters. Parameters that will receive special attention, as being integral to modelling of production, are: length, weight, and age at attainment of sexual maturity; ovulation rate; seasonality; mean calving interval; age-specific rates of pregnancy and lactation; and overlapping reproductive cycles. Of particular interest are individual, geographical, and exploitation-related components of variation in these parameters.

Approximately 250 papers containing relevant information on cetacean reproduction have been identified and indexed from an initial literature search of some 6,000 references. Well-documented reproductive information is available for such species as the bottlenose dolphin (Tursiops truncatus), common dolphin (Delphinus delphis), pantropical spotted dolphin (Stenella attenuata), spinner dolphin (S. longirostris), striped dolphin (S. coeruleoalba), and long-finned pilot whale (Globicephala melaena). Smaller, but significant, bodies of data exist for the Atlantic white-sided dolphin (Lagenorhynchus acutus), false killer whale (Pseudorca crassidens), short-finned pilot whale (Globicephala macrorhynchus), and killer whale (Orcinus orca). Data for the remaining 22 species of dolphins and delphinid whales are scattered and fragmentary, although the abstracts submitted for the conference indicate that more information is newly available for some of them.

The conference will also include reviews of the sperm whales by P.B. Best, Sea Fisheries Institute, South Africa; the monodontids--white whale and narwhal (H.W. Braham, Northwest and Alaska Fisheries Center); the platanistids (R.L. Brownell, U.S. Fish and Wildlife Service); and the baleen whales (C. Lockyer, Sea Mammal Research Unit, United Kingdom). A complete list of the 58 papers to be presented or circulated at the conference is available from Dr. William Perrin or Dr. Douglas DeMaster, Southwest Fisheries Center, P.O. Box 271, La Jolla, California 92038.

## Informal Review of Blood Hormone Studies Held

This month Vicky Kirby, Research Zoologist with the San Diego Zoo, met with Southwest Fisheries Center biologists to discuss the implications of her research on reproductive hormones for marine mammal studies. Dr. Al Myrick, Leader of the Marine Mammal Age Determination Project, discussed Kirby's findings in light of his own, concerning the length of the reproductive cycle from known-age animals. Dr. William Perrin, Marine Mammal Biology Program Leader, also discussed his work on reproduction of cetaceans in the eastern tropical Pacific, in view of Kirby's findings. Although few definite conclusions were drawn, Kirby's findings indicate that cetacean biologists may have to broaden their currently accepted concepts of how often animals ovulate and how variable this rate may be between animals of the same species. Because most of Kirby's material has come from captive cetaceans, further work will be needed using wild specimens. Kirby will present her findings at the International Conference on Cetacean Reproduction in La Jolla, California, from November 27-December 7, 1981 (see preceding article for details of conference topics).

## San Clemente Island Sea Lion Tagging Begins

On September 9, scientists from the Southwest Fisheries Center traveled to San Clemente Island, California, to begin tagging California sea lion pups to determine annual pup production. The team, led by Fishery Biologist Charles Oliver, included Mark Lowry, Biological Technician, David Holts, Fishery Methods and Equipment Specialist, and Lisa Ferm, Biological Technician; they were joined at the island by Jan Larsen, U.S. Navy Public Works, and Diane Clapp, Navy Contractor, Goat Removal Project.

The group surveyed the rookery during the afternoon of September 9 and counted approximately 191 $\pm$ 3 pups at the target site at Mail Point on the west side of the island. Returning the next morning, the group was able to tag 68 pups during the day. Three more pups were tagged on September 11, before the group returned to San Diego. The tags consist of white jumbo Rototags with black numbers. Each animal was sexed and tagged on both front flippers. The tags were placed at the rear edge of the flipper close to the body (please see accompanying photographs). Anyone finding or observing one of these tags should contact the Center after noting the date, location, and tag number.

Studies on the population of California sea lions at San Clemente Island are primarily aimed at determining the breeding population size and its rate of increase. One method of assessing relative increases in the population size involves determining annual pup production. To this end, tagging of pups late in the breeding season, coupled with periodic observations of the population, should yield valuable information on pup production, mortality, and distribution.

## Sea Lion Pups Tagged on San Miguel Island

During the last week of September, Dr. Robert DeLong, Northwest and Alaska Fisheries Center, led an effort to tag northern fur seals and California sea lions on San Miguel Island. Dr. Douglas DeMaster, Leader of the SWFC's Coastal Marine Mammal Project, worked with DeLong in an effort to standardize techniques and coordinate their respective research programs. DeMaster has begun tagging studies on California sea lions at San Nicolas, Santa Barbara, and San Clemente Islands. These studies will be used to determine rates of pup survival, recruitment, and the average age of adult females at first birth. Carolyn Heath, University of California, Santa Cruz, has received a contract to run the San Nicolas/Santa Barbara project, and Charles Oliver, Fishery Biologist, is directing the field work at San Clemente Island. (See preceding article and August 1981 issue of Center Monthly Report for additional details on San Clemente tagging.)

California sea lions, Zalophus californianus, near Mail Point, San Clemente Island. A female is at the left, an adult male in the center, and a pup at the right.

A California sea lion pup (at right) with two adult females shortly after being tagged at Mail Point, San Clemente Island, on September 10, 1981.

A tagged California sea lion pup. The white jumbo roto tags are clearly visible at the base of both flippers.

## Contracts to Study Otoliths, Pilot Whales, and Pinnipeds of the Channel Islands

Sandy Hawes, formerly a Biological Aid at the Southwest Fisheries Center, has been awarded a contract to study the relationship between squid beak size and body weight, and between the size of rockfish otoliths and body weight. This contract, which deals with food habits of California sea lions, is part of the SWFC research program studying food habits of coastal marine mammals. Dr. Douglas DeMaster, Wildlife Biologist, will serve as the Contract Officer's Technical Representative (COTR). The contract will involve a literature review, an analysis of available material (both fresh and preserved), and the collection of new material. In addition, studies on the decomposition rate of hard parts during the digestion process of seals may be undertaken if time permits.

Dr. William Perrin, Program Leader, will serve as the COTR for a contract with Hubbs/Sea World Research Institute (HSWRI) to study techniques to discriminate stocks of pilot whales. Three specific tools will be explored: 1) analysis of dorsal color pattern, 2) acoustic discrimination, and 3) identification of seasonal movement patterns. This research will be conducted on HSWRI's vessel, the Amigo, where 10-day quarterly cruises will be run, along with aerial surveys, to document local densities and movement patterns.

A request for proposal (RFP) for a photogrammetry contract to develop a "turn-key" type system to monitor pinnipeds of the Channel Islands National Park has been released. The contract calls for the application of state-of-the-art photogrammetry for monitoring populations of coastal pinnipeds. At a minimum, the technique will provide information on distribution and on total numbers hauled out by species. The clarity of stereoscopic imagery may even allow discrimination between the younger age classes. At present, estimates of sea lion pup production using oblique aerial photography are about 1/2 of the counts determined by ground surveys (which are both expensive and labor-intensive). The purpose of the contract is to develop a relatively quick, inexpensive technique to monitor population trends and haulout patterns of pinnipeds that use the Channel Islands. Dr. Douglas DeMaster will also be COTR for this contract.

## Computer Coding Format Developed for Dolphin Age Data

Dr. Al Myrick, Leader of the Marine Mammal Age Determination Project, reports that Project members have collaborated with members of the Dolphin Stock Assessment Program to develop a format for collecting and coding age-determination readings and pertinent data associated with layer-counts made from dolphin teeth. The coding format, now being prepared in final draft, will include fields for readings of cemental and dentinal layers, reading confidence ratings, age interpretation, and type and quality of tooth preparation, as well as a series of elements that will be used to identify sources of reader bias and to define ranges of variation for repeated multiple readings.

The system design will be compatible with the format of existing life-history data bases and will enable easy retrieval of age and age-related data developed in previous years. In addition to expediting transference of raw data onto the computer bases, the form also provides tooth readers with a standardized system of data collection. The Marine Mammal Age Determination Project staff has been busy assembling raw data from multiple tooth readings of 1600 spotted dolphins for coding while the form is being readied for use.

## Hawaiian Monk Seal Recovery Team Leader Visits SWFC

This month Dr. William Gilmartin, Leader of the Hawaiian Monk Seal Recovery Team, spent 3 days at the La Jolla Laboratory working on the introduction and activities outline of the Monk Seal Recovery Team. Gilmartin had recently reviewed sections on food habits and the list of recovery-related

During his visit, Gilmartin and Dr. Douglas DeMaster, Leader of the SWFC's Coastal Marine Mammal Project, reviewed the population section and the activities outline; the remaining section of the plan, the narrative for the activities section, will be completed by Gilmartin on his return to Hawaii. Gilmartin also helped DeMaster prepare a research plan for developing techniques to immobilize sea lions.

## MARINE MAMMAL MONITORING AND ASSESSMENT PROGRAM

### Contract Awarded to Develop Marine Mammal Sighting Methodology

Dr. Tim Smith, Program Leader, reports that the Southwest Fisheries Center has completed contractual arrangements with a San Diego firm to develop the sighting technology, including computer software and hardware, for collection of more accurate marine mammal sighting data aboard research ships. The contractor will develop techniques to electronically measure the sighting distance and angle while accounting for errors caused by the movement of the ship (i.e., pitch, roll, etc.). The data will then be stored and/or retrieved from the ship's computer for further analysis. Historically, marine mammal sightings data have been collected by observers on board vessels who have visually estimated the sighting distance and angle from the vessel to the sighted school. These data have lacked the precision necessary for use in line transect models which form an integral part of NMFS efforts to determine the status of dolphin stocks in the eastern tropical Pacific (ETP). The new technology will be useful not only for ETP surveys but also will have application to other marine mammal surveys such as those for the International Whaling Commission's minke whale studies.

### Porpoise Kill Monitoring System Now on VAX

This month Biological Statistician Bruce Wahlen, Computer Programmer Ken Wallace, and Biological Technician Robert Franco completed the conversion of the software programs for monitoring the fleet-wide kill of porpoise from the INFONET to the VAX computer system at the University of California, San Diego. Attendant program conversions and alterations, coded by contractor Jay Walker, are also now available.

### SWFC Access to INFONET Terminated

On September 30 Southwest Fisheries Center access to Computer Science Corporation's INFONET teleprocessing network was terminated. All SWFC-created files and domestic tape volumes on the INFONET system were dropped effective October 1. Data bases for the years 1979-1981 and for all reproductive life history data have been transferred to the VAX system at the University of California, San Diego. New data base software have been developed which include VAX/VMS DATATRIEVE (a data base management language) and comprehensive data base formatting subroutines.

TUNA/BILLFISH RESOURCES PROGRAM

## Center Scientists Attend Sixth North Pacific Albacore Meeting

This month Dr. Norman Bartoo, Fishery Biologist, and Dr. R. Michael Laurs, Oceanographer, attended the sixth North Pacific Albacore Workshop, held in Shimizu, Japan, from September 1-5. The workshop assessed the condition of the North Pacific albacore resource after reviewing the current data and research on albacore. Workshop participants representing the United States, Japan, and Canada concluded that albacore is being fished somewhat below maximum sustainable yield (MSY) at levels of effort less than those needed to produce MSY. Developing new albacore fisheries increases the need for improved statistical analyses and more accurate age-structured analyses. A report on the workshop and its findings is forthcoming and will be printed in Japanese and English.

## Draft of Billfish/Shark Management Plan Reviewed

On September 10 and 11 members of the Billfish and Oceanic Shark Fishery Management Plan Development Team of the Pacific Fishery Management Council (PFMC) met at the Southwest Fisheries Center to review the draft fishery management plan (FMP) before submission to PFMC headquarters. Dr. Sam Herrick, Industry Economist, and Dr. Wes Parks and Jim Squire, Fishery Biologists, were among the review participants. The new FMP draft was published and distributed to all interested parties by September 25, 1981. Meetings between the Team, the Council, and the Council's Advisory Sub-Panel are planned for early October.

The new FMP draft updates the April 1979 draft and lists 25 options for the three billfish and oceanic shark fisheries that are covered by the Plan: recreational rod-and-reel fishery for striped marlin and swordfish fishery, commercial harpoon swordfish, and drift gill net fishery for oceanic sharks and swordfish. The Draft Plan rates the proposed options on their ability to attain each of the Council's five Plan objectives and also weighs the ratings relative to the importance of each Plan objective as determined by the Council's Advisory Panel. Each of the options was assigned a rating for the purpose of assisting the Council in selecting options for a management regime.

Catches of striped marlin off southern California by the recreational fleet is approaching a record high for recent years. Over 800 fish have been weighed-in at San Diego alone. Catches will probably surpass the 1974 catch of 1,500 fish. The all-time record year was 1959 with a catch of over 2,400 fish; 1963 was the second highest with 1,900 fish.

## Status of Atlantic Tuna Fishery Sampling Programs

During the period January 1, 1981 to October 1, 1981, six U.S. tuna purse seiners fishing in the Atlantic Ocean unloaded in Puerto Rico. Twenty-eight

samples were collected for size composition analysis by Inter-American Tropical Tuna Commission personnel for the SWFC. The sampling distribution by species is as follows:

| Species | #Vessels sampled | # of samples | # of fish sampled |
|---|---|---|---|
| Yellowfin | 6 | 11 | 544 |
| Skipjack | 6 | 14 | 701 |
| Bigeye | 2 | 3 | 53 |

Foreign-caught Atlantic tunas transshipped to Puerto Rico are sampled routinely for biological information by Biological Technician Eugene Holzapfel. Data on fork length, weight and species composition of catches are collected. Results of Holzapfel's sampling during the period January 1, 1981 to October 1, 1981 are as follows:

| Species | Gear | No. of samples | No. of fish sampled | Tonnage sampled (MT) |
|---|---|---|---|---|
| Yellowfin | Baitboat | 6 | 344 | 47.15 |
| | Purse Seine | 9 | 572 | 2022.98 |
| Skipjack | Baitboat | 2 | 100 | 237.67 |
| | Purse Seine | 4 | 200 | 743.50 |
| Bigeye | Baitboat | 7 | 263 | 61.80 |
| | Purse Seine | 1 | 36 | 80.54 |

# TIBURON LABORATORY

## FISH COMMUNITIES INVESTIGATION

### Feeding Habits of Widow Rockfish Studied

This month Peter Adams, Fishery Biologist with the Predator/Prey Task, analyzed gut contents of widow rockfish, Sebastes entomelas, collected last spring. This species schools near the sea floor at night and disperses in the water column by day--the reverse of the more usual pattern among fishes. Earlier study had shown that this commercially-important species (it has dominated the rockfish landings since 1979) feeds largely on salps and euphausiids during daylight dispersion periods. However, it was not known whether this rockfish also feeds on demersal organisms while in its nocturnal schools near the bottom. Adams' analysis showed that the gut contents of widow rockfish taken from bottom-dwelling nocturnal schools also contained mostly salps and euphausiids, apparently the remains of prey taken in the water column during the day. Adams considers this evidence that the widow rockfish does not feed while in its nocturnal schools.

### Sampling of Rockfishes at Northern California Ports Sharply Reduced

After 18 months of collecting data on age and season of sexual maturity, increasingly restrictive fiscal restraints have resulted in sharply reduced sampling of rockfishes at northern California ports. This month Fishery Biologist Tina Echeverria of the Rockfish Analysis Task traveled to various ports to revise and coordinate the program at its reduced level. The continuing effort will consist primarily of special projects, and will rely largely on samples taken by biologists of the California Department of Fish and Game. Particular attention will be given to composition of the sport and commercial rockfish landings according to species, sex, length, and age, and to identifying predators of juvenile rockfishes.

### Report Describes Swarms of Larvaceans at the Sea Surface

Susan Smith, Fishery Biologist with the Predator/Prey Task, is preparing a short report on surface swarms of sexually mature larvaceans (Oikopleura longicauda) observed offshore from Ano Nuevo Pt. during the March 1980 rockfish cruise. Extensive rust-colored surface streams of these pelagic tunicates (the rust color imparted by the gonads) were observed over a distance of at least 3 miles, and the individuals which were collected did not appear to be enclosed in their mucous "houses." This phenomenon has never been reported in the literature. The information is being prepared for possible inclusion in a paper on reproductive strategies of appendicularians by Charles Gault, California State University, Long Beach.

## UNDERUTILIZED FISHERY RESOURCES

### Experimental Octopus Fishing Started in Santa Barbara Channel

Lt. Patrick Rutten, NOAA Corps, this month completed a week of trial trap-fishing for octopus in the Santa Barbara Channel. A trap of Australian design constructed of two 4-inch by 30-inch plastic pipes bolted together was tested. Twenty-five unbaited traps were fished on a longline of 800 yd in depths of 11-13 fathoms. The traps were set in an area where Octopus rubescens and O. bimauloides are known to occur. Only one octopus was caught in each of two sets, one of 24-h and the other of 72-h duration. Both octopus were small, under 200 grams. The traps will continue to be fished by a cooperating local fisherman to learn if the poor catches are due to seasonal factors or gear design, and whether the availability of octopus is too low for commercial fishing. Fishing localities and soak times will be varied to try to improve catch rates.

### Pelican Bay Explored for Scallops

At the request of the California Department of Fish and Game (CDF&G), the research vessel David Starr Jordan conducted a scallop-hunting cruise at the California-Oregon border on September 20-22. Cruise leader Sus Kato and Tony Chess of the Tiburon Laboratory participated in the cruise, together with Ron Warner and Pat Collier of the California Department of Fish and Game, and Chris Toole, Sea Grant Marine Advisor. All the guest scientists are stationed at Eureka, California. Twenty-eight half-hour rows were made in Pelican Bay, with a 6-ft commercial scallop dredge and an experimental crab dredge, in depths of 15-60 fathoms. Scallops were found in 35-40 fathoms only, and large numbers were taken exclusively at the 35-fm stations. The largest catch, about 200 pounds, was taken not with the commercial dredge, which is presently being used in the Oregon scallop fishery, but with a dredge ordinarily used on the east coast for catching blue crabs. Since that dredge weighs only around 250 pounds, or one-third of the standard dredge, it can be used by smaller vessels and its lower operating costs may make it feasible to fish commercially for scallops in Pelican Bay despite the relatively low catch rates. According to Warner, the meat yield of the scallops was 10 % of the total weight, and 27 scallops yielded a pound of meat.

### Bids Awarded for Experimental Fisheries Work

A bid has been awarded to Nor'Eastern Trawl Systems for construction of a 40-ft beam trawl which will be tested for its efficiency in catching ridgeback prawn, a species occurring primarily off Santa Barbara, California. The net will be used by a cooperating fisherman to learn if savings in energy costs are substantial enough, compared to otter trawls, to offset expected lower catch rates.

The commercial trawler Oregon Beaver has been awarded a bid for a 7-day charter cruise. The trawler will test two "semi-pelagic" off-bottom trawls to see if they can catch shortbelly rockfish while avoiding other species. The cruise is scheduled for November.

## PHYSIOLOGICAL ECOLOGY INVESTIGATION

### Pollutant Studies on Striped Bass Nearing Completion

Dr. Jeannette A. Whipple, Investigation Leader, reports that the final results of field studies conducted from 1978 to 1980 assessing the condition and pollutant burden of striped bass from the San Francisco Bay-Delta system await the completion of computer data analyses. Most of the data have been entered into the computer; the remaining data are being checked for accuracy prior to loading into the computer for factor analyses. The results should provide a better understanding of the striped bass population decline and whether or not pollutants assume a role in this decline. It is hoped these data will also provide at least an indication of the cause of heavy parasite (nematodes and cestodes) loads occurring in the population.

Earlier work to identify which pollutants may be contributing to the population decline (from an estimated 3 to 4.5 million adults in 1960 to 1.2 to 1.5 million currently) indicated that certain metals found at relatively high concentrations in body tissues may be implicated. Liver, muscle, and gonad samples from fish captured at four locations within the Bay-Delta complex and samples from fish collected in Coos River, Oregon (control location) were sent to Moss Landing Marine Laboratory for zinc, copper, and iron analyses. Preliminary inspection of the data showed that Cu and Fe levels were similar in all locations; however, Zn levels in ovarian samples from three of four locations within the Bay-Delta system were considerably higher than those from the Coos River. The average zinc concentration in fish ovaries from Coos River was 29.0 $\pm$ 20.1 µg/g dry weight whereas those from the Chipps Island and Martinez areas of the Delta averaged 479.3 $\pm$ 30.2 and 336.7 $\pm$ 108.5 µg/g, respectively.

### Data from Parasite/Pollutant Interaction Studies to be Analyzed

Data from a series of laboratory experiments conducted this summer to assess the impact of zinc, benzene, and a zinc-benzene combination on parasitized (anisakid nematode larvae) and non-parasitized juvenile striped bass have been key-punched for computer analysis. Following the analysis of the field data, these data will be analyzed to determine specific effects of these toxicants and parasites on the physiology of the fish. The results will be used to evaluate the hypotheses that sublethal levels of the pollutants act as stressors and promote immunosuppressive responses to parasites, which were derived from initial observations from the field studies.

Investigations conducted elsewhere on mammalian and fish species have determined that various stressors, both chemical and physical, cause dose-dependent elevations in plasma adrenocorticosteroids. Research has shown that a primary response to stressors is the production of cortisol, cortisone, and/or corticosterone depending upon the species. Elevated corticosteroid levels produce a wide array of secondary responses, such as hyperglycemia, glycogen depletion, protein catabolism, fatty acid mobilization and immunosuppression. Analytical methods used currently to measure corticosteroids in fish are largely nonspecific; that is, they simply determine a total corticosteroid response and do not identify, or differentiate, the contribution of each steroid to the overall response. A greater knowledge of toxicant impact could be gained by determining which corticosteroids are produced and how each is affected. Oceanographer Dr. R. Bruce MacFarlane is presently developing a method to achieve this goal using high-performance liquid chromatography. A procedure has been established to separate and quantify each of the steroids, and a method to isolate the steroids from other interfering lipids present in fish plasma is being researched.

In the pollutant/parasite experiments conducted this summer, fish were first implanted with nematodes, then after two weeks were exposed to the pollutants. Starting in October an experiment will be performed, led by Dr. Michael Moser, Judy Sakanari, and Carol Reilly, University of California, Santa Cruz, whereby juvenile striped bass will be exposed to the pollutants for 2 weeks, then implanted with nematodes, followed by re-exposure to the pollutants or placed in clean water (depuration) for four weeks. At weekly intervals following parasite implant, samples will be taken for autopsy, hematology, tissue pollutant analysis, and serum immunoelectrophoresis (immune response). The results from this experiment and the previous one should help determine whether it is the pollutants which reduce the animal's immune response to parasites, or the parasites which reduce the detoxifying response to pollutants.

## Alicyclic Hexanes Toxicity Study Completed

Investigation Leader Dr. Jeannette Whipple reports that the acute, static bioassays of seven alicyclic hexanes using striped bass and bay shrimp have been completed. Alicyclics tested included cyclohexane, methylcyclohexane, ethylcyclohexane, 1,1-dimethylcyclohexane (DMCH), 1,2-DMCH, 1,3-DMCH, and 1,4-DMCH. The 1,2-DMCH was the most toxic to both species for the 24 and 96-h intervals. Acute toxicity ranged from 4.7 to 10.9 ppm for striped bass and 1.5 to 6.5 ppm for bay shrimp in the 24-h tests. The 96-h tests generally showed a slightly higher toxicity. Alicyclic hexanes were in the same acute toxicity range as the monocyclic aromatic hydrocarbons. This may be due to the lower water solubility of alicyclics as compared to aromatics. If the water contains emulsifiers, the alicyclic may be far more toxic than aromatics. The acute toxicity values of the tested alicyclics are listed in Table 1.

Table 1. Acute toxicity of seven alicyclic hexanes to striped bass and bay shrimp.

| | STRIPED BASS | | | | BAY SHRIMP | | | |
|---|---|---|---|---|---|---|---|---|
| | 24-hr | | 96-hr | | 24-hr | | 96-hr | |
| CHEMICAL | $LC_{50}$ | 95%C.L. | $LC_{50}$ | 95%C.L. | $LC_{50}$ | 95%C.L. | $LC_{50}$ | 95%C.L. |
| Cyclohexane | 8.3 | * | 8.3 | --- | 3.4 | --- | 2.4 | 1.7-3.5 |
| Methylcyclohexane | 7.0 | 5.7-8.6 | 5.8 | --- | 3.5 | 3.0-4.0 | 3.3 | 2.9-3.9 |
| Ethylcyclohexane | 10.9 | 6.6-17.5 | 8.8 | 6.0-13.0 | 3.7 | 2.9-4.8 | 3.1 | 2.1-4.5 |
| 1,1 Dimethylcyclohexane | 7.5 | 6.6-8.5 | 6.9 | 6.3-7.6 | 6.5 | 6.1-6.9 | 5.2 | --- |
| 1,2 Dimethylcyclohexane | 4.7 | 3.2-6.9 | 3.2 | --- | 1.5 | .82-2.6 | 1.0 | .58-1.8 |
| 1,3 Dimethylcyclohexane | 9.9 | 8.3-11.8 | 9.3 | 8.0-10.8 | 6.2 | 5.5-6.9 | 6.2 | 5.5-6.9 |
| 1,4 Dimethylcyclohexane | 6.7 | 6.0-7.3 | 6.5 | 5.7-7.3 | 2.8 | 2.0-3.8 | 1.5 | --- |

* No confidence limits were calculated from tests without partial mortalities.

# SOUTHWEST REGIONAL DATA MANAGEMENT AND ADP OPERATIONS

## California Fishery Information Network Reviewed

Fred Kellenberger, Data Systems Manager, reports that on September 14 and 15 the Southwest Fisheries Center (SWFC) and the California Department of Fish and Game (CDF&G) hosted a workshop in Long Beach, California, for personnel from the Hawaii Division of Aquatic Resources (HDAR) and the SWFC's Honolulu Laboratory.

During the workshop David Hamm, Compuer Systems Analyst at the Honolulu Laboratory, and Henry Sakuda and Alvin Katebam, HDAR, reviewed the California Fishery Information Network (FIN) and the CDF&G statistical system. This review gave HDAR personnel the opportunity to see first-hand how the FIN is contributing to upgrading the CDF&G system, and allowed them to become familiar with the CDF&G fish dealer reporting system.

On September 16, a review of the progress of the HDAR system study was held at the La Jolla Laboratory. This study, which should be completed in December 1981, will indicate how the HDAR statistical system should be upgraded to meet HDAR, NMFS, and the Western Pacific Management Fisheries Council information requirements. Five micro-computers have been procured for the Central and Western Pacific Fishery Information Network to aid in the upgrading process. The micro-computers will be used for local data entry, editing, summarization, and report generation functions in support of the data collection system at American Samoa, Guam, Northern Marianas Islands, and the State of Hawaii. This is a major step in the standardization and modernization of data collection and handling capabilities in the Western Pacific area.

## Conversion of FRS to ADP Network Continues

On September 17 Fred Kellenberger, Data Systems Manager, and Dorothy Roll, Systems Analyst, met with Oden Burris, Computer Programmer, and John Davies, Computer Specialist stationed at the Southwest Region, to review the progress on converting the Financial Reporting System (FRS) from the INFONET system to ADP Network Service. Due to the differences between the two host computers on the handling of data structures and word boundaries, the completion of the year-to-date report was delayed 2 weeks. Early October is the new target date for the completion of the five remaining reports (Task Development Plans, Center, Laboratory, Resources, and Financial Summary). On September 28, the FRS reports ending the FY 1981 for the SWFC were completed and validated. These are the final reports from the INFONET system.

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With the termination of the INFONET services at midnight, September 30, data files for all SWFC projects on INFONET have been transferred to magnetic tapes. Backup copies have been made and all data have been validated on UCSD's Burroughs/VAX systems.

## Purchase of Word Processor for Oceanic Division is Approved

Fred Kellenberger, Data Sytems Manager, reports that the Department of Commerce has approved the purchase of a dual station/dual disk NBI 3000 word processor for the Oceanic Fisheries Resources Division at the La Jolla Laboratory. The series 3000 has communication capability to host computers. The existing dual NBI System II in the Oceanic Division will be assigned to the Coastal Fisheries Resources Division and ADP Operations. Approval has also been given to purchase an intelligent terminal system (APPLE II) for the Pacific Environmental Group, Monterey, California, and five Texas Instrument 787's for the La Jolla Laboratory. The TI 787 is a portable terminal with multiple speed transmission rate up to 1200 baud and compatibility with Bell 103A, Bell 212A, and Vadic 3400 modems.

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The Department of Commerce has also approved a request by the Southwest Fisheres Center for an 18-month computer services contract with the University of Oregon (UO). Tom Polacheck, a SWFC employee stationed at UO, Eugene, Oregon, will access the DEC 1091 and IBM 4341 systems for an extensive analysis of tuna vessel performance data.

## NASA Contract for Purse Seine Simulation Formalized

Dorothy Roll, Systems Analyst, reports that the contract with NASA Langley Research Center has been formalized and the account and user identification has been established. The prime user of this CDC virtual memory machine is Tom Stephens of Beers Associates, Inc., La Jolla, California, who is the contractor developing the numerical simulation of the purse seining process.

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Dorothy Roll has been appointed the treasurer for the Southern California ADP Federal Council for FY 1982. On September 23 she attended a meeting in the San Diego Federal Building when the new slate of officers took over the responsibilities from the officers-in-charge.

## Four Technical Users Meetings Held in September

ADP operations hosted four computer technical users meetings during September. Jeff Laake, Associate Scientist, IATTC, presented two excellent sessions on DATATRIEVE's Record Selection Expressions and VIEWS. The other sessions focused on DATATRIEVE's Record Definitions.

# MISCELLANEOUS

## HONORS AND AWARDS

### La Jolla Laboratory

This month Dr. Paul E. Smith received a Certificate of Achievement from the Johns Hopkins University First National Search. The award was in recognition of Smith's "dedicated and valued contribution to this national program for enhancing the quality of life for handicapped people through the application of personal computing."

## PRESS RELEASE

### Honolulu Laboratory

September 11 - "National Marine Fisheries Service research vessel Townsend Cromwell makes final cruise of 5 year Northwestern Hawaiian Islands survey."

## SEMINARS

### Tiburon Laboratory

September 16 - Dr. Tyson Roberts, California Academy of Sciences, presented a talk on "Ichthyological exploration of Borneo" at a joint San Francisco State University/ Tiburon Laboratory seminar held at the Tiburon Laboratory.

## TRAINING

### La Jolla Laboratory

August 3 - September 29 - Dr. Tim Smith, Fishery Biologist - "Elements of Supervision," San Diego, California.

Tiburon Laboratory

September 1 - Maxwell Eldridge, Fishery Biologist - Start of full-time university training, Oregon State University, Eugene, Oregon.

VISITORS

Honolulu Laboratory

September 15 - Ken Filak, Fisheries Officer, Veva'u, Tonga, visited Fishery Biologist Tamio Otsu.

16 - Dr. Teruo Harada, Director, Fisheries Laboratory, Kinki University, Japan, and H. Kondo, Chief Secretary to the chairman of the International Cultural Foundation, Japan, visited T. Otsu. Dr. Harada is one of the leading researchers in fish culturing in Japan and is presently pioneering tuna culturing work.

17 - Carroll McCutcheon, Chief of Personnel, Northwest Administrative Service Office, visited Laboratory Director Richard Shomura.

25 - Dr. Yoshiaki Matsuda, Associate Professor, Laboratory of International Policy, Kagoshima University, and also Adjunct Research Associate, Environment and Policy Institute, East-West Center, Honolulu, visited Tamio Otsu.

- Mantaro Nishikawa, Shizuoka Prefectural Fisheries Experimental Station, and formerly captain of the station's research vessel Fuji Maru, visited Tamio Otsu.

La Jolla Laboratory

September 8 - Mike Fraser, Planning Officer, Southwest Region, visited Dave Mackett, Center Planning Officer.

10 - Sandy Sanderson, Assistant Editor, "Vista," University of San Diego.

14 - Carroll McCutcheon, Chief of the Personnel Division, NASO, visited Dr. Izadore Barrett, Center Director, and Ben Remington.

16 - Al Katekaru and Henry Sakada, Hawaii Department of Aquatic Resources, and David Hamm, Honolulu Laboratory, came to the Center to attend a FIN meeting.

- David Hamm, Computer Systems Analyst, Honolulu Laboratory, SWFC.

17 - Steve Gibbs, Institute of Marine Studies, University of Washington, visited Dr. Reuben Lasker, Chief of the Coastal Fisheries Resources Division, La Jolla Laboratory.

- John Davies, SWFC employee stationed at the Southwest Region, Terminal Island, California.

21 - Dr. Pierre Haren, Assistant to the Director of Marine Fishes, Ministry of the Sea, Paris, France, met informally with members of the SWFC's Tuna and Billfish Resources Program.

- Yoshiaki Matsuda, Kagoshima University, Kagoshima, Japan.

- Holmes S. Moore, NOAA-OAI, Rockville, Maryland.

22 - Carl Nettleton and Karen Coker, National Coalition for Marine Conservation, San Diego, California.

23 - Rolm P. Peck, North Carolina State University, Raleigh, North Carolina.

28-30 - Dr. Andrew Dizon, Fishery Biologist, Honolulu Laboratory, met with various staff members at the Center.

Tiburon Laboratory

September 2 - Ed Gleason and Dolores Apton, Pacific Telephone and Telegraph Company, San Francisco, California.

4 - F.T. Weiss, Shell Oil Company, San Ramon, California.

- S. Tsunematsu, TAIYO Fishery Company, Ltd., Tokyo, Japan.

16 - Lani Uhry and Meryl Sundove, National Audubon Society, Tiburon, California.

- John Hopkirk, Sonoma State University, Rohnert Park, California.

## MEETINGS AND TRAVEL

### Honolulu Laboratory

September 2 - Laboratory Director Richard Shomura, Dr. Jeffrey Polovina, and Richard Uchida participated in a meeting of the Coordinating Council on Research in the Northwestern Hawaiian Islands held at the Honolulu Laboratory.

3 - Richard Shomura participated in a Honolulu Laboratory-Western Pacific Regional Fishery Management Council (WPRFMC) meeting to discuss historical data compilation and vessel classification.

8 - Richard Shomura attended a meeting regarding spiny lobsters, endangered species, and threatened species, called by the Western Pacific Program Office.

- Richard Shomura and Mary Lynne Godfrey, Administrative Officer, attended the Combined Federal Campaign kickoff luncheon meeting at Camp Smith, Honolulu.

9 - Richard Shomura attended the Hawaii Undersea Research Laboratory (HURL) meeting called by Dr. H.E. Chave, Science Program Director of HURL.

18 - Richard Shomura attended a meeting at WPRFMC Chairman Wadsworth Yee's office for discussions with a Korean delegation composed of Adm. Hwang and Mr. Lee of the Korean Deep Sea Fisheries Association regarding Pacific billfishes.

23 - Richard Shomura traveled to Hilo, Hawaii, to meet with Hawaii County officials on the burnt tuna problems.

25 - Richard Shomura further discussed the burnt tuna problem with Dr. Robert M. Nakamura of the University of Hawaii Animal Science Department.

27-29 - Richard Shomura traveled to La Jolla, California, for the Center Management Meeting on budget matters.

30 - Richard Shomura attended a ciguatera committee meeting at the Hawaii Department of Health.

La Jolla Laboratory

August 28-September 10 - Dr. Norm Bartoo traveled to Shimizu, Japan, to participate in the 6th North Pacific Albacore Workshop, and to Seattle, Washington to discuss the albacore model with University of Washington staff.

August 30 - September 2 - Dr. Reuben Lasker traveled to Boulder, Colorado, to prepare a MARMAP document at the request of Center Directors.

September 1 - Jim Squire and Ken Raymond traveled to Catalina Island, California, to take photos of Catalina seafood and aerial photos of sportsboats in support of the Center billfish program.

2 - Dave Mackett traveled to Terminal Island, California, to meet with the Southwest Region Planning Officer on southern area representation at the forthcoming Regional Director/Center Director/Office Director's meeting.

3 - John Carr and Dr. Gary Sakagawa traveled to Terminal Island, California, to attend a discussion on tuna/porpoise issues and amendments to the Marine Mammal Protection Act.

8-11 - Wayne Perryman traveled to San Francisco, California, to attend the American Society of Photogrammetry meeting.

9-16 - Dr. Daniel Huppert traveled to Seattle, Washington, to attend the National Standards Workshop and to Orcas Island, Washington, to participate in the Ocean Resource Economics Workshop.

10-11 - The Billfish and Oceanic Shark Management Plan Development Team of the Pacific Fishery Management Council held a meeting at the Center.

13-15 - Fred Kellenberger attended FIN meetings with personnel from California Fish and Game and the

Hawaii Department of Aquatic Resources, in Long Beach, California.

15-18 - John Carr, Deputy Director, and Dr. Gary Sakagawa traveled to Albuquerque, New Mexico, to attend the annual meeting of the American Fisheries Society.

16 - A Fishery Information Network (FIN) meeting was held at the Center.

20-24 - Dr. Izadore Barrett, Center Director, traveled to Washington, D.C. to attend the Regional Directors/ Center Directors/Office Directors meeting.

28-29 - A Southwest Fisheries Center Management meeting was held at the Center.

30 - Dr. Izadore Barrett, Center Director, traveled to Tiburon, California to discuss FY 1982 and 1983 budgets with Tiburon Laboratory Director and staff.

Tiburon Laboratory

September 8-11 - Laboratory Director Norman Abramson and Edward Ueber traveled to Ft. Bragg, Eureka, and Crescent City, California, for meetings with industry representatives, California Department of Fish and Game employees, and Humboldt State University faculty members.

10-11 - Tina Echeverria traveled to Morro Bay and Monterey, California, to collect samples and gear and to terminate temporary employees.

15-16 - Ted Hobson and Tony Chess traveled to Albion and Mendocino, California, to conduct research studies.

15-17 - Tina Echeverria traveled to Crescent City, Eureka, and Ft. Bragg, California, to collect samples and gear and to terminate temporary employees.

- Brian Jarvis traveled to La Jolla, California, to pick up a boat and trailer for the Laboratory.

29-30 - Dr. William Lenarz traveled to Portlnd, Oregon, to attend the Groundfish Management Team Meeting.

PERSONNEL ACTIONS

Honolulu Laboratory

September 5 - Daniel C. Chung, Computer Clerk - Termination.

- Eric P. Knudtson, Wildlife Biologist - Resignation.

6 - Robert B. Moffitt, Biological Technician - Reassignment to Fishery Biologist.

- Jeffrey J. Polovina, Statistician - Promotion.

11 - Steven H. Kramer, Biological Technician (Fisheries) - Termination.

19 - Alan R. Everson, Biological Technician (Fisheries) - Termination.

- Louise F. Lembeck, Editorial Clerk - Termination.

- Robert J. Morrow, Biological Aid (Wildlife) - Termination.

- Nathaniel T. Shippen, Biological Technician (Fisheries) - Termination.

- Edward J. Webman, Computer Technician - Termination.

- Karen P. Wendel, Computer Aid - Resignation.

20 - Linda A. Barraclough, Biological Aid - Conversion to Stay-in-School Appointment.

- Henry M. Kishinami, Biological Aid - Change to LWOP Status.

- James H. Prescott, Biological Technician (Fisheries) - Change to LWOP Status.

- Rodney T. Watson, Biological Aid - Conversion to Stay-in-School Appointment.

30 - Henry M. Kishinami, Biological Aid - Extension to Complete Temporary Appointment.

La Jolla Laboratory

August 23 - Roy Allen, Illustrator - Promotion.

- Morgan Busby, Biological Technician - Pay adjustment.

September 1 - Kate Coleman, Clerk - Resignation.

10 - Amy Kimball, Biological Aid - LWOP.

- Elise Rothschild, Clerk - Termination.

11 - Virginia Cass, Fishery Biologist - Pay adjustment LWOP effective 9/20/81, Return to duty effective 10/4/81.

12 - Richard Kiy, Biological Aid - LWOP.

19 - Karen Blakney, Biological Aid - Extension of Temporary Appointment, NTE 5/11/82.

- Morgan Busby, Biological Technician - Termination.

- David Eriquat, Computer Assistant - Termination.

- Dan Fern, Computer Clerk - Extension of Temporary Appointment, NTE 5/11/82.

- Caroline Hastings, Biological Aid - Termination.

- Sandra Hawes, Biological Aid - Termination.

- Gary Hunt, Biological Technician - Termination.

- Lee Inness-Brown, Physical Science Technician - Termination.

- Nate Kostrubala, Computer Aid - Termination.

- Michael Lichter, Computer Aid - Termination.

- Cindi Haight Meyer, Biological Aid - Termination.

- Ragan Nicholl, Biological Aid - Termination.

- Philip Tarantino, Statistical Assistant - Termination.

- Mark Zdeb, Computer Assistant - Termination.

September 20 - Dimitry Abramenkoff, Biological Technician - Promotion.

- David Au, Fishery Biologist - Reassignment.

- Tod Foster, Biological Technician - Reassignment.

- Dave Holts, Fishery Biologist - Reassignment.

- Susan Iacometti, Computer Specialist - Promotion. Promotion.

- Jacqueline Jennings, Fishery Biologist - Reassignment.

- Makoto Kimura, Fishery Biologist - Reassignment.

- Charles Oliver, Fishery Biologist - Reassignment.

- Ken Wallace, Computer Specialist - Reassignment.

25 - Shari Sitko, General Biologist - Extension of Temporary Appointment, NTE 2/21/82.

26 - Lisa Ferm, Biological Technician - Extension of Temporary Appointment, NTE 1/19/82.

- Scott Miller, Biological Aid - Extension of Temporary Appointment, NTE 1/18/82.

- Drew Stanley, Biological Laboratory Technician - Extension of Temporary Appointment, NTE 1/4/82.

Tiburon Laboratory

September 5 - Frank Jacques, Biological Science Student, LWOP.

- Susan Logan, Biological Aid - LWOP.

19 - Lisa Andrade, Biological Aid - Termination.

- Michael King, Biological Aid - Termination.

- Sally Krenn, Biological Aid - Termination.
- Steven Pace, Biological Aid - Termination.
- Susan Pollock, Biological Aid - Termination.

UNITED STATES
DEPARTMENT OF COMMERCE

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